

What is claimed is:

1. A process for preparing a phenolic polymer via polymerization of phenolic monomers having unsaturated aliphatic chains in the presence of peroxidase biocatalyst and an oxidant, wherein said polymerization uses as a mediator a phenothiazine derivative substituted with an alkyl group or alkyl carbonic acid.
2. The process according to claim 1, wherein said phenothiazine derivative is used in a concentration of 20-100 μ M with respect to the total reactant.
3. The process according to claim 1, wherein said phenothiazine derivative is ethyl phenothiazine or phenothiazine-10-propionic acid.
4. The process according to claim 1, wherein said phenolic monomer is a plant phenolic oil.
5. The process according to claim 1, wherein said peroxidase biocatalyst is a plant- or fungus-derived peroxidase including horseradish peroxidase, soybean peroxidase, Coprinus peroxidase and Aspergillus peroxidase.
6. The process according to claim 1, wherein said oxidant is hydrogen peroxide or hydroalkyl peroxide.
7. A radical cured resin of the phenolic polymer prepared according to any process of claims 1-6.
8. A coating material comprising the radical cured resin of claim 7.